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STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
LI, SHI K	
ART UNIT	PAPER NUMBER
2633	4

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	**Application No.** 09/776,630	**Applicant(s)** SAKAMOTO ET AL.	
	Examiner Shi K. Li	**Art Unit** 2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 May 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-10 and 18-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites the limitation "wherein a setting of said pre-emphasis in said pre-emphasis performing means is made after controlling a setting of an α parameter representing an amount of the optical wavelength chirp in said chirp applying means" in lines 16-18 of the claim. The limitation is not described in the specification as originally filed or supported by the specification. The specification describes in page 16, last paragraph to adjust the setting of α parameter, adjust the setting of pre-emphasis, and repeating the control algorithm sequence. Similarly, claim 10 recites the limitation "wherein the setting of said pre-emphasis is made after controlling the setting of the α parameter representing an amount of the optical wavelength chirp" in lines 14-16 of the claim. The limitation is not described in the specification as originally filed or supported by the specification. The specification describes in page 16, last paragraph to adjust the setting of α parameter, adjust the setting of pre-emphasis, and repeating the control algorithm sequence. Similarly, claim 18 recites the limitation "wherein the pre-emphasis setting in said pre-emphasis performing unit is made after the α parameter setting" in

lines 17-18 of the claim, and claim 20 recites the limitation "wherein the pre-emphasis setting is made after the α parameter setting representing the amount of the optical wavelength chirp" in lines 16-17 of the claim. These limitations are not described in the specification as originally filed or supported by the specification.

3. Claims 11-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 11 recites the limitation "said control means of said transmitting terminal station and said Raman amplification control means of said optical repeater station control the setting of pre-emphasis in said pre-emphasis performing means after controlling the supply condition of Raman excitation light in said Raman amplifier" in lines 23-26 of the claim. The limitation is not described in the specification as originally filed or supported by the specification.

4. Claim 17 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 11 recites the limitation "wherein a setting of the pre-emphasis in said pre-emphasis performing means is after controlling a setting of an α parameter representing an amount of the optical wavelength chirp in said chirp applying means" in lines 16-18 of the claim and "said control means of said transmitting terminal station and said Raman amplification control means

of said optical repeater station control the setting of the α parameter representing the amount of the optical wavelength chirp in said chirp applying means, and the setting of pre-emphasis in said pre-emphasis performing means, after controlling the supply condition of Raman excitation light in said Raman amplifier" in lines 26-31 of the claim. The limitation is not described in the specification as originally filed or supported by the specification.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-3, 8-10 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara (Japan Patent Application Pub. JP 9-261205 with English translation provided by U.S. Patent 6,134,034 to which line numbers are referred in the following rejection) in view of Swanson et al. (U.S. Patent 6,433,904 B1), Satoh (6,583,910 B1) and Pierre ("Optimization Theory with Applications" by D. Pierre, Wiley 1969 with republication by Dover in 1986, pp. 414-417).

Regarding claims 1, 10, 18 and 20, Terahara discloses in FIG. 17 a WDM communication system comprising a transmitting terminal station 98, a receiving terminal station 100, SNR monitor 116, reception information transmission means 118 and control device 124. Terahara teaches in col. 5, lines 30-31 to control pre-emphasis based on the reception information about each wavelength transmitted from the receiving terminal station. Regarding claims 1 and 10, the

differences between Terahara and the claimed invention are (a) Terahara does not teach measuring error rate and (b) Terahara does not teach chirp applying means.

Swanson et al. teaches in col. 9 lines 37-40 that BER can be measured by measuring SNR and estimated from the SNR. One of ordinary skill in the art would have been motivated to combine the teaching of Swanson et al. with the WDM communication system of Terahara because accurate direct BER measurement takes a long time for low BER (see col. 9, lines 22-25). Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to measure SNR and estimate BER based on the SNR, as taught by Swanson et al., in the WDM communication system of Terahara because accurate direct BER measurement takes a long time for low BER.

The modified communication system of Terahara and Swanson et al. fails to teach a chirp applying means. Satoh teaches in FIG. 9 a transmitter 10 in which a chirp parameter α is controllable. One of ordinary skill in the art would have been motivated to combine the teaching of Satoh with the modified communication system of Terahara and Swanson et al. because controlling the chirp parameter can compensate dispersion of optical fiber as explained by Satoh in col. 5, lines 1-64. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a chirp controlling means, as taught by Satoh, in the modified communication system of Terahara and Swanson et al. because controlling the chirp parameter can compensate dispersion of optical fiber.

The modified communication system of Terahara, Swanson et al. and Satoh still fails to teach an iterative optimization sequence for applying chirp control and pre-emphasis control. Pierre teaches in Section 7-10d, p. 414 region-limiting strategies and iterated dynamic

programming. When an optimization problem has many states variables, it is desirable to optimize based on a subset of the state variables first and then optimize based on another subset of the state variables and repeat the process until some optimization criteria have been achieved (e.g., when the improvement is insignificant, i.e., less than a predetermined value). One of ordinary skill in the art would have been motivated to combine the teaching of Pierre and the modified communication system of Terahara, Swanson et al. and Satoh because the approach of Pierre simplifies the problem and provides a systematic way to achieve an optimized result. The limitation also requires to adjust the setting of α parameter first and then adjust the setting of pre-emphasis. Applicant provides some reason in the Remarks of the amendment filed on 24 May 2004. However, the reason is not persuasive, not supported by the specification and fails to establish criticality of the limitation. Some setting must be provided at the beginning to start with. The most reasonable setting is to have the same power level for each channel. Successive adjustments of α parameter setting and pre-emphasis setting to reduce BER based on feedback will eventually achieve a local optimization, as taught by Pierre. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the setting of α parameter first and then adjust the setting of pre-emphasis and repeat the control sequence iteratively until some optimization criteria have been achieved, as taught by Pierre, in the modified communication system of Terahara, Swanson et al. and Satoh because the approach of Pierre simplifies the problem and provides a systematic way to achieve an optimized result.

Regarding claims 2 and 19, Terahara teaches in col. 13, lines 21-24 to superimpose reception information on a signal light transmitted in a direction from the receiving terminal station 100 to the transmitting terminal station 98.

Regarding claim 3, Terahara teaches in FIG. 5 multiplexing device 18 for multiplexing optical signals generated by a plurality of laser diodes.

Regarding claims 8 and 9, Swanson et al. teaches in col. 9 lines 37-40 that BER can be measured by measuring optical or electrical SNR and estimated from the SNR.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara, Swanson et al., Satoh and Pierre as applied to claims 1-3, 8-10 and 18-20, above, and further in view of Taga et al. (U.S. Patent 5,790,289).

Terahara, Swanson et al., Satoh and Pierre have been discussed above in regard to claims 1-3, 8-10 and 18-20. The difference between Terahara, Swanson et al., Satoh and Pierre and the claimed invention is that Terahara, Swanson et al., Satoh Pierre do not teach to control an optical amplifier. Taga et al. teaches in FIG. 2 to include an optical amplifier in a pre-emphasis control circuit and control the gain of the amplifier from a controller. One of ordinary skill in the art would have been motivated to combine the teaching of Taga et al. with the modified communication system of Terahara, Swanson et al., Satoh and Pierre because the SNR at the receiving end of a wavelength can be adjusted by adjusting the gain of an amplifier to achieve a desirable bit-error rate. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the gain of an optical amplifier based on the reception information, as taught by Taga et al., in the modified communication system of Terahara, Swanson et al., Satoh and Pierre because the SNR at the receiving end of a wavelength can be adjusted by adjusting the gain of the amplifier to achieve a desirable bit-error rate.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara, Swanson et al., Satoh and Pierre as applied to claims 1-3, 8-10 and 18-20 above, and further in view of Khaleghi et al. (U.S. Patent 6,040,933).

Terahara, Swanson et al., Satoh and Pierre have been discussed above in regard to claims 1-3, 8-10 and 18-20. The difference between Terahara, Swanson et al., Satoh and Pierre and the claimed invention is that Terahara, Swanson et al., Satoh and Pierre do not teach an optical add/drop multiplexer (ADM). Khaleghi et al. teaches in FIG. 3 ADM 130 with a transmitter Tx5. ADM allows traffic to be dropped off and added at convenient locations along the transmission path. FIG. 3 suggests to control the power level of Tx5 by adjusting amplifier 20 in the same way power levels of wavelengths are adjusted in a transmitting terminal station. One of ordinary skill in the art would have been motivated to combine the teaching of Khaleghi et al. with the modified communication system of Terahara, Swanson et al., Satoh and Pierre because the SNR of the added wavelength at the receiving terminal station depends on the power level of the transmitter at the ADM instead of the power level of the transmitter at the transmitting terminal station due to the dropping and adding of the wavelength channel. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the power level of a transmitter at a ADM, as taught by Khaleghi et al., in the modified communication system of Terahara, Swanson et al., Satoh and Pierre because the SNR of the added wavelength at the receiving terminal station depends on the power level of the transmitter at the ADM instead of the power level of the transmitter at the transmitting terminal station due to the dropping and adding of the wavelength channel.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara, Swanson et al., Satoh and Pierre as applied to claims 1-3, 8-10 and 18-20 above, and further in view of Eggleton et al. (U.S. Patent 6,370,300 B1).

Terahara, Swanson et al., Satoh and Pierre have been discussed above in regard to claims 1-3, 8-10 and 18-20. The difference between Terahara, Swanson et al., Satoh and Pierre and the claimed invention is that Terahara, Swanson et al., Satoh and Pierre do not teach wavelength dispersion compensation at the transmitting terminal station. Eggleton et al. teaches in FIG. 12 to use reception information for controlling a dispersion compensator at a remote (transmitting) station. One of ordinary skill in the art would have been motivated to combine the teaching of Eggleton et al. with the modified communication system of Terahara, Swanson et al., Satoh and Pierre because dispersion compensation can improve received signal quality. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reception information to control a dispersion compensator at the transmitting terminal station, as taught by Eggleton et al., in the modified communication system of Terahara, Swanson et al., Satoh and Pierre because dispersion compensation can improve received signal quality.

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara, Swanson et al., Satoh and Pierre as applied to claims 1-3, 8-10 and 18-20 above, and further in view of Eggleton et al. (U.S. Patent 6,370,300 B1) and Bülow (U.S. Patent 6,016,379).

Terahara, Swanson et al., Satoh and Pierre have been discussed above in regard to claims 1-3, 8-10 and 18-20. The difference between Terahara, Swanson et al. and Satoh and the claimed invention is that Terahara, Swanson et al., Satoh and Pierre do not teach wavelength dispersion compensation and polarization-mode dispersion compensation at the receiving

terminal station. Eggleton et al. teaches in FIG. 12 to use reception information for controlling a wavelength (chromatic) dispersion compensator 33 at a receiving terminal station. One of ordinary skill in the art would have been motivated to combine the teaching of Eggleton et al. with the modified communication system of Terahara, Swanson et al., Satoh and Pierre because dispersion compensation can improve received signal quality. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the reception information to control a wavelength dispersion compensator at the receiving terminal station, as taught by Eggleton et al., in the modified communication system of Terahara, Swanson et al., Satoh and Pierre because dispersion compensation can improve received signal quality.

The modified communication system of Terahara, Swanson et al., Satoh, Pierre and Eggleton et al. still fails to teach polarization-mode compensation. Bülow teaches in FIG. 1 a receiver with PMD compensation. FIG. 1 comprises a signal monitor 8, control logic 7, delay lines D1-Dn and equalizers E1-En. One of ordinary skill in the art would have been motivated to combine the teaching of Bülow with the modified communication system of Terahara, Swanson et al., Satoh, Pierre and Eggleton et al. because compensating PMD further improves received signal quality and reduces error. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include PMD compensator in the receiving terminal station, as taught by Bülow, in the modified communication system of Terahara, Swanson et al., Satoh, Pierre and Eggleton et al. because compensating PMD further improves received signal quality and reduces error.

11. Claims 11-14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara (Japan Patent Application Pub. JP 9-261205 with English translation provided by U.S.

Patent 6,134,034 to which line numbers are referred in the following rejection) in view of Swanson et al. (U.S. Patent 6,433,904 B1), Ford et al. (U.S. Patent 6,392,769 B1), Stephens (U.S. Patent 6,236,487 B1) and Pierre ("Optimization Theory with Applications" by D. Pierre, Wiley 1969 with republication by Dover in 1986, pp. 414-417).

Regarding claims 11 and 16, Terahara discloses in FIG. 17 a WDM communication system comprising a transmitting terminal station 98, a receiving terminal station 100, SNR monitor 116, reception information transmission means 118, control device 124 and a plurality of repeaters 104. Terahara teaches in col. 5, lines 30-31 to control the pre-emphasis based on the reception information about each wavelength transmitted from the receiving terminal station. Regarding claims 11 and 16, the differences between Terahara and the claimed invention are (a) Terahara does not teach measuring error rate, (b) Terahara does not teach a reception information transfer means for sending control information to repeaters and (c) Terahara does not teach to use Raman amplifiers in the repeaters.

Swanson et al. teaches in col. 9 lines 37-40 that BER can be measured by measuring SNR and estimated from the SNR. One of ordinary skill in the art would have been motivated to combine the teaching of Swanson et al. with the WDM communication system of Terahara because accurate direct BER measurement takes a long time for low BER (see col. 9, lines 22-25). Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to measure SNR and estimate BER based on the SNR, as taught by Swanson et al., in the WDM communication system of Terahara because accurate direct BER measurement takes a long time for low BER.

The modified communication system of Terahara and Swanson et al. fails to teach sending control information to the repeaters from the transmitting terminal station. Ford et al. discloses in FIG. 1 a WDM control system comprising three repeaters 103, 104 and 105. Ford et al. teaches to use λc to send control information to the repeaters as illustrated in FIG. 3. One of ordinary skill in the art would have been motivated to combine the teaching of Ford et al. with the modified communication system of Terahara and Swanson et al. because wavelength power level may have attenuated unequally by the transmission fiber and need correction. Based on information such as power level at transmitting station and measured power level at the repeater, a controller can control gain of amplifier in the repeater to make accurate correction. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to send control information from the transmitting terminal station to the repeaters, as taught by Ford et al., in the modified communication system of Terahara and Swanson et al. because wavelength power level may have attenuated unequally by the transmission fiber and need correction.

The modified communication system of Terahara, Swanson et al. and Ford et al. still fails to teach Raman amplifiers in the repeaters. Stephens teaches in FIG. 2 a WDM channel power control arrangement where signal varying devices (repeaters) 16 are controlled by reception information. Stephens suggests in col. 6, line 3 to use Raman and erbium amplifiers for the gain adjusting devices. One of ordinary skill in the art would have been motivated to combine the teaching of Stephens with the modified communication system of Terahara, Swanson et al. and Ford et al. because Raman amplifiers can operate over a wide wavelength range. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Raman amplifiers in the repeaters and adjust channel power based on reception information, as

taught by Stephens, in the modified communication system of Terahara, Swanson et al. and Ford et al. because Raman amplifiers can operate over a wide wavelength range.

Pierre teaches in Section 7-10d, p. 414 region-limiting strategies and iterated dynamic programming. When an optimization problem has many states variables, it is desirable to optimize based on a subset of the state variables first and then optimize based on another subset of the state variables and repeat the process until some optimization criteria have been achieved (e.g., when the improvement is insignificant, i.e., less than a predetermined value). One of ordinary skill in the art would have been motivated to combine the teaching of Pierre and the modified communication system of Terahara, Swanson et al., Ford et al. and Stephens because the approach of Pierre simplifies the problem and provides a systematic way to achieve an optimized result. The limitation also requires to adjust the supply condition of Raman excitation light in said Raman amplifier first and then adjust the setting of pre-emphasis. Applicant provides some reason in the Remarks of the amendment. However, the reason is not persuasive, not supported by the specification and fails to establish criticality of the limitation. Some setting must be provided at the beginning to start with. The most reasonable setting is to have the same power for each channel and an amplification gain for the Raman amplifier such that the power level at the receiver is between minimum threshold and maximum threshold. Successive adjustments of Raman supply condition of Raman excitation light and pre-emphasis setting to reduce BER based on feedback will eventually achieve a local optimization, as taught by Pierre. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the Raman supply condition of Raman excitation light first and then adjust the setting of pre-emphasis and repeat the control sequence iteratively until some optimization

criteria have been achieved, as taught by Pierre, in the modified communication system of Terahara, Swanson et al., Ford et al. and Stephens because the approach of Pierre simplifies the problem and provides a systematic way to achieve an optimized result.

Regarding claim 12, Stephens suggests in col. 6, line 7 to use erbium (a rare earth element) fiber.

Regarding claim 13, Terahara teaches in col. 13, lines 21-24 to superimpose reception information on a signal light transmitted in a direction from the receiving terminal station 100 to the transmitting terminal station 98.

Regarding claim 14, Stephens suggests in FIG. 3 to transmit reception information from the reception terminal station.

Regarding claim 15, Ford et al. teaches in col. 3, lines 36-39 that only node 105 provides equalization while the other nodes do not provide equalization.

12. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terahara (Japan Patent Application Pub. JP 9-261205 with English translation provided by U.S. Patent 6,134,034 to which line numbers are referred in the following rejection) in view of Swanson et al. (U.S. Patent 6,433,904 B1), Satoh (6,583,910 B1), Stephens (U.S. Patent 6,236,487 B1) and Pierre ("Optimization Theory with Applications" by D. Pierre, Wiley 1969 with republication by Dover in 1986, pp. 414-417).

Terahara discloses in FIG. 17 a WDM communication system comprising a transmitting terminal station 98, a receiving terminal station 100, SNR monitor 116, reception information transmission means 118, control device 124 and a plurality of repeaters 104. Terahara teaches in col. 5, lines 30-31 to control the pre-emphasis based on the reception information about each

wavelength transmitted from the receiving terminal station. Regarding claims 11 and 16, the differences between Terahara and the claimed invention are (a) Terahara does not teach measuring error rate, (b) Terahara does not teach chirp applying means and (c) Terahara does not teach to use Raman amplifiers in the repeaters.

Swanson et al. teaches in col. 9 lines 37-40 that BER can be measured by measuring SNR and estimated from the SNR. One of ordinary skill in the art would have been motivated to combine the teaching of Swanson et al. with the WDM communication system of Terahara because accurate direct BER measurement takes a long time for low BER (see col. 9, lines 22-25). Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to measure SNR and estimate BER based on the SNR, as taught by Swanson et al., in the WDM communication system of Terahara because accurate direct BER measurement takes a long time for low BER.

The modified communication system of Terahara and Swanson et al. fails to teach a chirp applying means. Satoh teaches in FIG. 9 a transmitter 10 in which a chirp parameter α is controllable. One of ordinary skill in the art would have been motivated to combine the teaching of Satoh with the modified communication system of Terahara and Swanson et al. because controlling the chirp parameter can compensating dispersion of optical fiber as explained by Satoh in col. 5, lines 1-64. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a chirp controlling means, as taught by Satoh, in the modified communication system of Terahara and Swanson et al. because controlling the chirp parameter can compensating dispersion of optical fiber.

The modified communication system of Terahara, Swanson et al. and Satoh still fails to teach Raman amplifiers in the repeaters. Stephens teaches in FIG. 2 a WDM channel power control arrangement where signal varying devices (repeaters) 16 are controlled by reception information. Stephens suggests in col. 6, line 3 to use Raman and erbium amplifiers for the gain adjusting devices. One of ordinary skill in the art would have been motivated to combine the teaching of Stephens with the modified communication system of Terahara, Swanson et al. and Satoh because Raman amplifiers can operate over a wide wavelength range. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Raman amplifiers in the repeaters and adjust channel power based on reception information, as taught by Stephens, in the modified communication system of Terahara, Swanson et al. and Satoh because Raman amplifiers can operate over a wide wavelength range.

Finally, Pierre teaches in Section 7-10d, p. 414 region-limiting strategies and iterated dynamic programming. When an optimization problem has many states variables, it is desirable to optimize based on a subset of the state variables first and then optimize based on another subset of the state variables and repeat the process until some optimization criteria have been achieved (e.g., when the improvement is insignificant, i.e., less than a predetermined value). One of ordinary skill in the art would have been motivated to combine the teaching of Pierre and the modified communication system of Terahara, Swanson et al., Satoh and Stephens because the approach of Pierre simplifies the problem and provides a systematic way to achieve an optimized result. The limitation also requires to adjust the supply condition of Raman excitation light in said Raman amplifier first and then adjust the setting of pre-emphasis. Applicant provides some reason in the Remarks of the amendment. However, the reason is not persuasive, not supported

by the specification and fails to establish criticality of the limitation. Some setting must be provided at the beginning to start with. The most reasonable setting is to have the same power for each channel and an amplification gain for the Raman amplifier such that the power level at the receiver is between minimum threshold and maximum threshold. Successive adjustments of Raman supply condition of Raman excitation light, α parameter setting and pre-emphasis setting to reduce BER based on feedback will eventually achieve a local optimization, as taught by Pierre. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the Raman supply condition of Raman excitation light first and then adjust the setting of α parameter and pre-emphasis, and repeat the control sequence iteratively until some optimization criteria have been achieved, as taught by Pierre, in the modified communication system of Terahara, Swanson et al., Satoh and Stephens because the approach of Pierre simplifies the problem and provides a systematic way to achieve an optimized result.

Response to Arguments

13. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 703 305-4341. The examiner can normally be reached on Monday-Friday (8:30 a.m. - 5:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 703 305-4729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

skl

JASON CHAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600